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# Measuring "Awareness of Environmental Consequences": Two Scales and Two Interpretations

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ABSTRACT

*Moderate or poor reliabilities, worrisome correlation patterns and ambiguous dimensionality raise questions about the awareness of consequences scale being a valid measure of egoistic, social-altruistic and biospheric value orientations. These results may, however, indicate something else. An exploratory analysis performed on three samples collected from the general public provides evidence for a reinterpretation of the scale. We believe the concepts of egoistic, social and biospheric value orientations remain important as a potential explanation of behaviour. However, our results imply that whether people cognitively organise their beliefs in this way when considering adverse environmental consequences requires a different approach from the current awareness of consequences scale. The evidence shows the current scale must be reinterpreted as a measure of concern over the positive and negative consequences of environmental action and inaction.*

Keywords: environmental beliefs, value orientations, environmental scales, egoistic, altruistic, biospheric, value-belief-norm model

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## INTRODUCTION

Climate change, biodiversity loss, pollution of air, water and soil, and resource shortages are some of the environmental challenges of the 21st Century. Tackling ecological problems implies modifying a range of human behaviours conducted by the whole spectrum of societal actors from the individual citizen to corporations and governments. A variety of motives may stimulate or prevent action. Theoretical models can help identify key drivers and obstacles to achieving behavioural change. Yet, in order for behavioural models to be policy relevant, they need to provide a descriptive account of the interactions between variables and withstand empirical testing.

Some time ago, Heberlein (1981) declared the essential need for research to increase understanding of how people cognitively organise beliefs and feelings about environmental issues. A subsequent growth in environmental attitude-behaviour research has resulted in the development of several behavioural models (Ajzen, 1991; Grob, 1995; Homburg and Stolberg, 2006; Ohtomo and Hirose, 2007). Stern, Dietz and Kalof (1993) proposed one of the more sophisticated models. They integrated assumptions made by several other theories into a broader behavioural framework of environmental intentions which has since developed into the Value-Belief-Norm (VBN) model (Stern, 2000; Stern, Dietz, Abel, Guagnano and Kalof, 1999). A key aspect of the VBN model is the hypothesised underlying value orientations related to the ego, social-altruism and the biosphere (Stern, Dietz and Guagnano, 1995a). These three components of environmental concern are expected to be distinguishable although correlated (Stern, Dietz and Kalof, 1993).

Questionnaires have then been developed to measure beliefs arising from the value orientations. However, the empirical results as to whether such questionnaires

demonstrate that people cognitively differentiate between egoistic, social-altruistic and biospheric consequences are at best mixed. Two approaches have been employed: the Environmental Concern (EC) scale and the Awareness of Consequences (AC) scale. Table 1 provides some examples of EC and AC questionnaire items. Applications using the EC scale have provided supporting evidence that people do cognitively construct positions consistent with the VBN model subscales (Hansla, Gamble, Juliusson and Gärling, 2008; Milfont, Duckitt and Cameron, 2006; Schultz, 2000, 2001; Schultz, Shriver, Tabanico and Khazian, 2004; Snelgar, 2006), while those employing the AC scale have consistently reported poor subscale reliabilities, theoretically inconsistent subscale correlations and poor dimensionality (Gärling, Fujii, Gärling and Jakobsson, 2003; Hansla et al., 2008; Joireman, Lasane, Bennett, Richards and Solaimani, 2001; Stern et al., 1993; Stern, Dietz, Kalof and Guagnano, 1995b). Whether the AC scale is a good measure of the three underlying positions has also been questioned (Snelgar, 2006; Spash, 2006), but no study has yet investigated the possibility that the AC scale may be measuring an alternative cognitive process.

*TABLE 1 ABOUT HERE*

This paper presents new results questioning whether the AC scale is an appropriate measure of the VBN value orientations. Across two studies, three large samples (N=572, 511, 531) were collected from the general public in the United Kingdom (UK) as part of on-going work relating to economic valuation of the environment using the hypothetical market approach of contingent valuation (Spash, 2000, 2006; Spash et al., 2008). Previously published results from the first study, see Spash (2006), were interpreted as consistent with a separation between selfish-altruism, where gain to others is of direct benefit to the individual (a perspective common in

economics), and social-altruism, where benefiting others is an end in itself. The AC social-altruistic scale can then be seen as a mixture of items from these two categories. The evidence supported the idea of selfish-altruism being related to egoism while social-altruism was associated with biospherism, i.e. a two factor solution. This appears to be in broad agreement with Snelgar (2006) who, on the basis of a convenience sample, found that the existing AC measures of social-altruistic concern are more closely allied to the egoistic than to the biospheric, with the latter associated with a general type of altruism. However, Spash found a three factor solution and Snelgar that from two to five factors could be derived depending upon the analysis employed. Reanalysis of the Spash study data combined with data from a second study has led to the results reported here which move to a different perspective on the content and meaning of the AC scale.

In the next section we describe the VBN model and the role of the AC scale as developed in the literature to measure the three value orientations. Specific items behind the scale are discussed and issues arising from published empirical work are reported. Section 3 explores an alternative approach to understanding the results. Section 4 describes our data and methods, and Section 5 the results which are discussed in Section 6. Our analysis compares the dimensionality of the three UK samples with the rotated component matrix presented by Snelgar (2006). We employ an exploratory analysis so as to remain open to the possibility that the AC scale could be measuring an alternative cognitive representation. We find that such a representation is indeed present and can be interpreted as a scale addressing concern for negative and positive environmental consequences related to action versus inaction.

## AWARENESS OF CONSEQUENCES: THEORY AND MEASUREMENT

Stern et al.'s (1993) social psychological model is based on assumptions originating in Schwartz's (1977) Norm Activation Model. This posited that altruistic behaviour is the result of an individual being explicitly aware of the consequences (AC) in terms of social harm of not performing a behaviour and that they accept responsibility (AR) for the performance of that behaviour. AC combined with AR increases the probability that a person will feel morally obliged to act. The VBN model extends Schwartz's definition in two ways. First, the "awareness of harmful consequences" construct, which originally described an explicit awareness of consequences, now includes beliefs about potential future world states. For example, an individual may believe that "thousands of species will die within the next decade", which may or may not happen. Second, environmental behaviour is regarded as being the result of awareness of adverse consequences affecting (i) oneself, (ii) other humans and (iii) non-humans.

Stern et al. (1993) then proposed three types of value orientations relevant to environmentalism: self interest, altruism towards other humans, and altruism towards other species and the biosphere[2]. These three types of environmental concern have been argued to be logically distinct guiding principles (Stern et al., 1999), that can only be challenged in terms of desirability or appropriateness (Rokeach, 1973; Schwartz, 1992). The VBN theory posits that value orientation causally influences beliefs, because an individual's values biases them to select and believe in information that is congruent with that orientation and to deny value-incongruent information (Stern, 2000; Stern et al., 1999). For example, an active egoistic value

[2] The term 'biospheric altruism' is specifically used at one point (p.331) by Stern et al. (1993).

orientation would direct attention towards the subset of outcomes that affect oneself. Beliefs are defined as being loosely linked to self-identity, less general and less stable than values and challengeable in terms of veracity, while being more general and stable than specific attitudes (Stern et al., 1995b).

While value orientations are argued to causally influence beliefs, people also probably learn over time that there are real differences between consequences for the self, others and the environment. Some psychological models of memory are compatible with the notion that people form distinctive worldviews. For example, spreading-activation models of semantic memory (Collins and Loftus, 1975; Collins and Quillian, 1969; Quillian, 1968) argue that conceptual knowledge is stored as a system of propositions organized hierarchically, with some concepts being more closely linked together than others.

So there seems some potential to support the assumption that each of the three value orientations could independently influence pro-environmental intentions and behaviour (Stern et al., 1995a,b; Stern et al., 1993). However, whether people cognitively differentiate information about general adverse consequences, as proposed, is a hypothesis open to empirical investigation. Social psychologists have then administered the EC and AC environmental scales with the goal of measuring the distinctive environment concerns proposed by the VBN model.

The EC scale constructed by Schultz (2000) has produced the most supportive results. The EC scale employs the statement: *I am concerned about environmental problems because of consequences for '_____'*. Respondents are then asked to rate nouns such as: me, my health, people in the community, future generations, plants, trees, whales, etc. EC studies have reported exploratory and confirmatory analyses that verify Stern's hypothesised factor structure, as well as strong subscale

reliabilities and reasonably interpretable correlations between subscales (Hansla et al., 2008; Milfont et al., 2006; Schultz, 2000, 2001; Schultz et al., 2004; Snelgar, 2006). Such results provide strong evidence that people do differentiate adverse environmental consequences as proposed by Stern and colleagues.

The AC scale has been described as a measure of general beliefs about environmental consequences (Stern et al., 1995a). A set of items on a Likert scale measures awareness of consequences relating to each of the egoistic (ACego), social (ACsoc),[3] and biospheric (ACbio) value orientations. Table 2 displays subscale reliabilities reported by a variety of published studies (Gärling et al., 2003; Hansla et al., 2008; Joireman et al., 2001; Snelgar, 2006; Stern et al., 1993; Stern et al., 1995b). These show weak to moderate results. Early on Stern et al. (1993) reasoned that moderate reliabilities might be due to too few items being administered. However, both Gärling et al. (2003) and Hansla et al. (2008) had to remove an item from each scale in order to improve reliability, while Joireman et al. (2001) reported only moderate reliabilities despite having 4 to 5 item scales. Most studies conclude that a better set of items would improve reliability and that quest is undoubtedly in turn responsible for the variety found in published versions of the scale.

*TABLE 2 ABOUT HERE*

The several versions of the AC scale (i.e. using different items) have reported an assortment of measurement problems. Various correlation patterns between AC subscales indicate the questionnaire might have low construct validity. Based on the

[3] We designate the social-altruistic position as social, and so ACsoc, to represent the dominant aspect which is the concern for others in society. As noted in the introduction altruism may be defined as self-centred or selfless and therefore can also be associated with the other value orientations.

finding by Schwartz (1992), that self-transcendence and self-enhancement scales correlate negatively, the argument has been made that ACego should be negatively correlated with ACsoc and ACbio. However, studies have regularly reported positive correlations between all AC subscales (Joireman et al., 2001; Snelgar, 2006; Stern et al., 1993). The exception is Hanlsa et al. (2008) who found that administering a questionnaire including only negatively framed AC items produced a pattern consistent with ACego being negatively correlated with the other two subscales. Of greater concern is the finding that ACego does not correlate positively with the Schwartz's self enhancement scale (Stern et al., 1995b) or the EC egoistic scale (Snelgar, 2006).

Another major problem is the high correlation between subscales. Subscales have been reported to share the same variance as follows: 18.50% – 36.00% for Stern et al. (1993), 29.16% – 38.44% for Joireman et al. (2001) and for 8.24% – 14.98% Snelgar (2006). While Stern et al. (1993) foresaw the potential for significant correlations between the three AC beliefs, the amount of shared variance is worrisome, implying that the subscales are partially measuring another construct.

There have also been contradictory claims concerning the dimensionality of the AC scale. Snelgar (2006) has criticised studies (Stern et al., 1993; Stern et al., 1995b) employing a theta scaling procedure because this avoids dimensionality tests. There is no agreement as to how many dimensions the AC scale measures. The original goal was to assess beliefs relating to the three value orientations. However, Stern et al (1993) take the moderate correlation between the subscales as an indication that "value orientations may be part of a single perceptual package" (p.340). This is supported by both Stern et al. (1995a) and Stern et al. (1995b) who found principle components analysis yielded a one factor solution. Spash (2006) found a three

factor solution with the first loading most on egoistic and social items, the second on social and biospheric, and the third combining all three value orientations. Snelgar (2006) found from two to five factors could be extracted using principal axis factoring both with varimax and direct oblimin rotations, and also conducted principal component analysis. She concluded "no clear structure was obtained with any of these analyses. Thus it is not appropriate to attempt to label any of the factors/components" (p.91).

Doubts that the scales accurately measure three distinctive elements has led to calls for improvement by varying the number of items (Stern et al., 1993) or administering negative items only (Hansla et al., 2008). However, Snelgar (2006), who presents a thorough investigation of the measurement properties of the AC questionnaire, provides the most negative prognosis concluding that the EC scale is a better instrument and should be used in preference to the AC scale. There is, however, another possible interpretation of the scale to which we turn next. That is the AC items may be cognitively categorised using a criteria fundamentally different to the VBN authors' hypothesised belief systems.

## AN ALTERNATIVE INTERPRETATION

The items in the AC scale seem to combine a variety of aspects. The basic construction of the items is around a cause and a consequence. The consequence is for one of the 'objects' or entities relating to the value orientations. This means items are constructed by identifying an environmental problem and associating a target. For example, a biospheric item might be related to the problem of tropical deforestation with the consequences being for the Earth as a whole i.e. "Tropical rainforests are essential to maintaining a healthy planet Earth". In addition, wording is generally kept simple and there appears a desire for some variety of positively and

negatively phrased questions on each AC category to construct the overall scale. Yet, within this structure alternative interpretations seem to arise and the task facing a respondent may involve unforseen complexities. For example, as noted earlier, the social 'object' has been associated with altruism, but altruism can be motivated from selfish or selfless interest, and altruistic motives have also been associated with concern for the biosphere (Snelgar, 2006; Stern et al., 1993; Stern et al., 1995b). In addition, outcomes which are hard to classify seem to arise. For example, Spash (2006) found a third factor combining equal loadings across all three value orientations. This was interpreted as "an anti-environmental sentiment or lack of worry over possible environmental problems and a concern about the potential negative personal consequences of environmental protection" (Spash, 2006, p.611). The implication drawn being that negative egoistic attitudes failed to form part of the egoistic scale and seemed to separate out (Hansla et al., 2008). The possibility then arises that respondents are interpreting the items and clustering them in a totally different manner than that expected by the VBN model.

The heuristic bias literature (Kahneman, 2003; Kahneman, Slovic, and Tversky, 1982; Simon, 1982-1997) indicates that people resort to simplifying rules. The VBN authors agree noting that in many situations, including the response to a survey, people use simplifying heuristics (Dietz and Stern, 1995; Stern, 2000; Stern et al., 1995a). The VBN model argues that value orientations bias beliefs, which through a causal chain of variables ultimately influence behaviour. In other words, the VBN assumes that environmental decision making heuristics are ultimately based on an individual's value orientations. Gigerenzer and colleagues conceptualise heuristics differently, arguing that, rather than being guided by stable and abstract worldviews, heuristics are often adapted to the local environment (Gigerenzer, Todd and ABC

Research Group, 1999; Marsh, 2002). If an individual concludes a heuristic is not solving a problem, they are able to quickly switch to another type of heuristic, as each person is assumed to have a toolbox of simple decision strategies (Tooby and Cosmides, 1992). An individual's heuristical toolbox might include worldviews and value based heuristics, but would also be expected to include other simplifying strategies.

Closed ended questionnaire items must, by definition, frame the issue they address in a restrictive way. That an individual's response to a questionnaire can be dependent upon that framing is well know (Tversky and Kahneman, 1981; Wang, Simons and Bredart, 2001). Linguistic and cognitive scientists (Croft and Cruse, 2004; Lakoff, 1987; Pinker, 1998) have noted that some variations of a statement or sentence will result in a listener or reader extracting precisely the same meaning, while others, with seemingly subtle sentence variations, can result in the recipient forming radically different perceptions. Lakeoff (1987) argued that the meaning of a whole sentence is not a compositional function of the meaning of the parts of the sentence put together locally. Instead, the way the sentence is constructed may also have meaning. Hence, to construct an instrument that successfully differentiates between the proposed VBN value orientations, it is not enough to design a set of items which simply mention egoistic, social or biospheric objects. Special consideration should also be given to the type of response asked of the participants and how the items are phrased.

The EC and AC scales present different types of questions about adverse environmental consequences. Hansla et al. (2008) note that the EC items ask participants to evaluate consequences relating to specific attitudinal objects (i.e. self, trees, whales), while the AC scale has been described as measuring more the

abstract concept of beliefs about general environmental consequences ("Protecting the environment will threaten jobs for people like me"; "Environmental protection is beneficial for my health"). The measurement properties of the EC scale show people classifying specific attitudinal objects according to the structure proposed by Stern and colleagues. In contrast the reported measurement properties of the AC scale imply people are using a different categorisation criterion for general beliefs about more abstract objects.

Previous studies provide some clues for other alternative cognitive processes that could account for responses to the AC scale. As noted, Hansla et al. (2008) found that AC subscale correlations demonstrate a different pattern when using only the items phrased in terms of negative outcomes. This suggests respondents may sort bad environmental consequences into a distinctive perceptual category and good consequences into a separate category. In addition, Snelgar (2006: 88) has commented that:

> "As Stern et al. (1993, 1995) framed the value–belief–norm theory, beliefs that the consequences are adverse will result in action. The beliefs part of the theory can also be considered in terms of perceived costs and benefits for valued objects. Behavioural intention will be influenced by the perceived costs and benefits of a particular environmental action for each set of valued objects, weighted according to the individual's relative value orientations."

The principle component matrix reported by Snelgar (2006) suggests that people might differentiate between costs and benefits of not taking environmental action. What seems neglected is that individuals might experience cognitive dissonance (Festinger, 1957) if they conclude environmental protection is bad for them (as it will cost money and time), but good for the environment.

Indeed, there is strong empirical evidence that people do cognitively differentiate between negative and positive outcomes and are very sensitive as to whether statements are framed in terms of positive or negative outcomes, benefits or costs. Prospect theory (Kahneman and Tversky, 1979) suggests that individuals construct a reference point and then treat gains differently from losses. This is supported by the endowment effect (Kahneman, Knetsch and Thaler, 1990, 1991) and the economic literature comparing willingness to pay for environmental improvements versus willingness to accept compensation for environmental damages (Knetsch, 1994, 2005). A plethora of framing studies, such as Tversky and Kahneman's (1981) asian disease problem, suggest that choices can depend on whether the task is perceive in terms of benefits or costs. Regulatory focus theory (Higgins, 1987, 2000) also posits that people differentiate between the pursuit of gains and the avoidance of losses, and employ distinctive strategies to deal with each of these situations. Framing in terms of gains evokes a "promotion-focus" that leads to growth related strategies that strive to obtain an ideal goal. Framing in terms of losses can form a "prevention-focus", resulting in strategies to increase personal security in "what ought to be". Thus, a set of statements mentioning gains or losses may evoke the distinction between promotion or prevention (Semin, Higgins, Gil de Montes, Estourget and Valencia, 2005), rather than categories suggested by the AC literature.

Another possible criterion that respondents might employ to categorise AC questionnaire items is whether or not the items mention environmental protection and so positive action. Some AC items imply environmental action (eg. "environmental protection is beneficial to my health"), while others do not (eg. "the effects of pollution on public health are worse than we realise"; "claims that we are

changing the climate are exaggerated"). Anderson (2003) argues the psychological literature has often ignored fundamental differences between action and inaction, and that, other things being equal, people generally prefer no change. He refers to the principle of "conservation of energy" as an explanation. For example, the option of environmental action may involve inconvenience and monetary losses that are less salient under inaction. A range of psychological literature finds people prefer to do nothing as opposed to performing an action eg. status quo bias (Samuelson and Zeckhauser, 1988), omission bias (Ritov and Baron, 1990, 1992), inaction inertia (Tykocinski, Pittman and Tuttle, 1995) and choice deferral (Dhar, 1996).

In summary, social psychologists have long been aware that context influences perceptions (Brunswik, 1943; Lewin, 1943), and there is strong empirical research suggesting people cognitively differentiate between negative outcomes or losses and positive outcomes or gains, as well as being sensitive as to whether a proposal implies action or inaction.

## DATA AND METHOD

In order to analyse the issues raised we make use of two data sets collected as part of research on the contingent valuation of environmental changes. Both surveys were designed and all related research coordinated by Spash. In both cases respondents were members of the general public in the UK approached at home by a market research company employing a stratified random sampling procedure. The research was funded as part of European Community projects (see acknowledgments). The surveys included 13 AC items designed by Stern and colleagues taken from the following studies Stern et al. (1993), Guagnano, Dietz and Stern (1994), Stern et al. (1995a,b). In reviewing the literature the number of distinct ACbio items was found to be limited to just three and therefore an extra item was

designed and added by Spash (Table 3, item ACbio4). Similarly, Snelgar also designed an additional biospheric item (see Table 3, item ACbio5).

*TABLE 3 ABOUT HERE*

*Study 1*

A survey was constructed to assess the maximum willingness to pay of individuals for converting a small area of Cambridgeshire farmland into a wetland ecosystem. The 713 participants were members of the public from across the UK, with a national and regional sample split. The 45 item questionnaire was verbally administered and included questions regarding WTP, ethics and political action. Socio-economic data was also collected. In total 572 participants completed the 14 AC items shown in Table 3. Participants responded on a 4-point scale (1=strongly disagree; 4=strongly agree).

*Study 2 - Random and Non-random Samples*

A survey was conducted to assess the maximum amount people would personally be willing to pay each quarter on their electricity bill over the next year to restore biodiversity from 14% to 70% in the river Tummel and its surrounding area. In total 1069 people participated in the study between July and August 2004. They were residents from the Scottish regions of Inverness, Argyle and Bute, North Ayrshire, Highlands, Dumfries and Galloway, Aberdeen, Perth and Kinross, Aberdeenshire, Edinburgh and Glasgow. Participants were verbally administered a questionnaire that contained 50 items including the 13 AC items displayed in Table 3. Also included were questions on ethical belief system, general attitudes, socioeconomic status and Theory of Planned Behaviour.

The overall sample for Study 2 was split by a sequenced and random AC item ordering. The AC items were administered in a sequential order to 528 participants of whom 511 answered all the items. This sub-sample is designated here "non-random" sample. The other sub-sample were administered the AC items randomly mixed with Theory of Planned Behaviour questions. In this case of the 541 participants 531 successfully answered all of the AC items. This sub-sample we designate "random" sample. For both the "random" and "non-random" samples, participants answered the AC using a 7 point scale (1 = strongly disagree; 7 = strongly agree).

The following criteria will be used to assess whether the AC scale demonstrates the pattern proposed by Stern and colleagues: (i) bivariate correlations between subscales, (ii) reliability and (iii) dimensionality. Any emergent pattern will be assessed using the criteria of (i) interpretability, (ii) correlations between new factors and (iii) reliability.

RESULTS

Correlations between the subscales proposed by VBN authors are shown in Table 4. All of the correlations are large and positive. Note the correlations between (i) egoistic and social subscales, and (ii) egoistic and biospheric subscales are not negative. The subscales share between 21% and 45% of the same variance, which suggests that the constructs are partially measuring another construct.

*TABLE 4 ABOUT HERE*

Theoretical reliabilities were calculated. Table 5 displays Cronbach's α for the theoretical subscales for each of the three samples. The social subscale reported

reasonably good reliability. The egoistic and biospheric subscales reported moderate and poor reliability respectively.

*TABLE 5 ABOUT HERE*

Principle components analysis was conducted in the quest for alternative interpretable dimensions. In Table 6 the rotated component matrix from Snelgar's (2006) study and the three samples collected by Spash are presented alongside each other. Snelgar (2006) reported a principle components analysis with varimax rotation which we repeated in order to maximise the comparability between the studies. Principle axis factoring with varimax and direct oblimin rotations was also conducted and produced a similar structure to the results presented here.

*TABLE 6 ABOUT HERE*

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is an index for comparing the magnitudes of the observed correlation coefficients to the magnitude of partial correlation coefficients. The results were 0.877 for Study 1, 0.880 for Study 2 non-random and 0.892 for Study 2 random. These high KMO indexes provide evidence that the AC items can be grouped into a smaller set of underlying factors. This contradicts Snelgar's (2006) conclusion that the AC scale has no clear factor structure.

Eigenvalue scores being greater than 1 was the criteria employed to select how many components to be extracted from the principle components analysis. An assessment of scree plots confirmed that this approach was suitable. Study 1 and Study 2 non-random were found to have three components, while for Study 2 random there were two components. Table 6 reports the rotated loadings obtained for the three Spash study samples and the results reported in the Snelgar sample.

The rotated components matrix does not illustrate the theoretical structure proposed by VBN authors. For example, in all four samples, Factor 1 contained a mixture of egoistic, social and biospheric items. However, the combined rotated component matrix for the four studies does present consistent loading patterns. There are four clusters that consistently load together as shown in Table 7. Each of these clusters can be interpreted in terms of (i) costs and benefits, and (ii) environmental action and environmental inaction. Factor 1 is labelled “Benefits of Action”, Factor 2 is labelled “Costs of Action”, Factor 3 is labelled “Benefits of No Action” and Factor 4 is labelled “Costs of No Action”.

*TABLE 7 ABOUT HERE*

Inspection of the factor loadings in Table 6 indicates that “Benefits of Action” and “Costs of Inaction” load on the same factor for the random sample of Study 2 and for the Snelgar sample. These two clusters therefore are taken to form a combined factor which we label “Consequences of Environmental Action”. For all three of the samples collected by Spash, the “Costs of Action” items and “Benefits of Inaction” items loaded on the same factor. These items we combine into a factor labelled “Consequences of Environmental Inaction”.

Table 8 displays the bivariate correlations for the newly proposed subscales. In all three samples, “Benefits of Action” and “Costs of Inaction” demonstrated large positive correlations, which is consistent with the argument that they be part of the larger factor “Consequences of Environmental Action”. “Costs of Action” and “Benefits of Inaction” also demonstrate large positive correlations, which supports their combination into the factor “Consequences of Environmental Inaction”. “Benefits of Action” correlates negatively with both “Costs of Inaction” and “Benefits of Inaction”. “Costs of Inaction” is moderately correlated with both “Benefits of

Inaction" and "Cost of Action". While Table 8 displays some large correlations, there does seem to be a significant improvement over the AC subscale correlations (between 0.672 and 0.459) as presented in Table 4. The correlations between "Consequences of Environmental Inaction" and "Consequences of Environmental Action" are much smaller than the correlations between any of the AC subscales.

*TABLE 8 ABOUT HERE*

Table 9 displays Cronbach's α for the newly proposed subscales. The "Benefits of Action" scale, despite being a combination of egoistic, social and biospheric items, demonstrates an excellent reliability coefficient. The "Costs of Action" has moderate reliability, but when combined into the "Consequences of Environmental Action" scale once again demonstrates excellent reliability. The "Costs of Action" subscale and the "Benefits of Inaction" subscale possess moderate to low reliabilities, but are similar to the reliabilities for the biospheric subscales (see Table 5). Combining the cost and benefit subscales into the "Consequences of Environmental Inaction" subscale forms a moderately reliable subscale.

*TABLE 9 ABOUT HERE*

In summary, the new subscales show three areas of improvement compared to the AC subscales. First, the newly proposed subscales demonstrated superior dimensionality. Second, reliabilities for the "Consequences of Environmental Action" subscales are far superior to, while the "Consequences of Environmental Inaction" reliabilities are on par with, the AC subscales. Third, the correlation patterns are superior, demonstrating both lower correlations and theoretical consistency.

DISCUSSION

Poor reliabilities, high correlations between subscales and confusing subscale correlation patterns have been found for the AC scale. Rather than using a convenience sample as done by others (Joireman et al., 2001; Snelgar, 2006; Stern et al., 1993) the AC scale was administered to three large samples that were randomly recruited from the general population. Despite this and some improved statistics over other studies the results were broadly similar and the same kind of problems commonly found still persisted. In contrast to previous studies we then questioned the AC scale as a measure of the value orientations proposed by VBN theory, and investigated an alternative cognitive structure.

Our exploratory factor analysis shows strong evidence that people do not respond to the AC scale as hypothesised in the literature, and instead differentiate between environmental action and environmental inaction. Respondents were also found to differentiate between costs and benefits. Items on environmental action were found to demonstrate strong reliability, even though they consisted of a mixture of egoistic, social and biospheric statements. Items implying environmental inaction formed a scale demonstrating about the same reliability as the biospheric and egoistic subscales. The relative weakness of this scale is unsurprising given that it arises from items designed for a different purpose i.e. to measure AC beliefs. This means items could be adapted and new ones added to the questionnaire to directly address action/inaction costs/benefits and so verify the current conclusions.

These finding also shed light on some of the measurement anomalies in the AC scale literature. Where subscale reliabilities have proven satisfactory this may be due to a high proportion of environmental action items. Thus, the AC social subscale has 4 out of the 5 of its items classified into the factor “Consequences of Environmental Action” and was found to have higher reliabilities than the other

subscales (see Table 7). The fact that different concepts are being measured than those assumed by VBN theory also explains why the AC egoistic subscale has been found to be insignificantly correlated with the EC egoistic subscale and Schwartz's self enhancement scale.

Stern et al. (1993) designed the AC scale in order to test the proposition that people cognitively differentiate between egoistic, social and biospheric concerns when assessing adverse general environmental consequences. The VBN model has made a major contribution to the environmental attitude-behaviour literate and has had some empirical evidence to support it, eg. the EC scale has verified that people use the hypothesised cognitive categories. These models have also provided some clear logic as to why environmental beliefs are malleable. Results from both the AC and EC scales indicate the importance of context in forming cognitive representations of general environmental consequences. The EC scale seems to work by asking people to assess specific targets of environmental consequence. General belief statements under the AC scale, on the other hand, seem to increase the salience of information about whether action or inaction is required, and the differences between costs and benefits.

This highlights some of the difficulties involved in researching how people construct their beliefs and in particular those about general environmental consequences. The great linguistic philosopher Ludwig Wittgenstein once said that "Uttering a word is like striking a note on the keyboard of the imagination" (Wittgenstein, 1974). The challenge then is to understand how words play such notes and so form melodies or songs.

Most closed-ended attitudinal questionnaires request participants to summarise their opinions, perceptions or beliefs as simplified ordinal responses. However,

summarising beliefs about environmental problems into a simple questionnaire response can be a formidable task involving a complex mix of ethical, economic, temporal, social and technical issues. The fact that many people do so happily indicates that heuristical strategies cognitively simplify the meaning of questionnaire items. The framing of questionnaire information and items is likely to influence the choice of the cognitive strategy used to simplify questionnaire statements. One presentation format may highlight egoistic, social or biospheric components of a statement, while a slight alteration may make other aspects of essentially the same statement far more salient.

Heuristical researchers (Gigerenzer et al., 1999; Kahneman, 2003; Kahneman et al., 1982; Marsh, 2002; Simon, 1982-1997) suggest people use simplifying strategies in order to make flexible and timely social decisions. Some might argue that there are endless ways in which people can differentiate environmental beliefs, but there may also be a restricted number of commonly employed belief structures. The current study suggests that people can differentiate between costs/benefits, and action/inaction. The decision-making literature has suggested some other examples. Various authors have noted that people differentiate between general and specific beliefs (Ajzen, 1991; Heberlein, 1981; Stern, 2000; Stern et al., 1999; Stern et al., 1995a; Stern et al., 1993). Temporal Construal theorists have noted that there are some important differences between how people make judgements about the near and distant future (Liberman and Trope, 1998; Trope and Liberman, 2003). Evidence exists that people can employ either deontological or utilitarian based criteria when making environmental decisions (Spash, 1997, 2006), and in so doing employ different cognitive belief structures.

The concepts of "ego" and "others" seem fundamental to human psychology and so we might expect egoistic and social-biospheric beliefs to also be differentiated and be of relevance to concern over environmental consequences. The EC scale supports this hypothesis. This paper shows only that the work on AC scales is misdirected in believing that such concepts are being addressed by the current items it employs. At the same time the scale was found to function as a measure of concern over the positive and negative consequences of environmental action and inaction. On the basis of the evidence presented here, improving the scale as a measure of these concepts seems worthwhile. This may then provide a new tool useful in its own right and help environmental policy by supplying a new means of identifying an additional set of barriers to behavioural change.

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*Table 1. Example of EC and AC scale items*

| Awareness of Consequences Scale | Environmental Concern Scale |
|---|---|
| *Egoistic items* | *Egoistic items* |
| • Environmental protection will provide a better world for me and my children | I am concerned about environmental problems because of the consequence for _____ |
| • Protecting the environment will threaten jobs for people like me | • My lifestyle<br>• My health |
| *Social/Altruistic items* | *Social/Altruistic items* |
| • Environmental protection will help people have a better quality of life | I am concerned about environmental problems because of the consequence for _____ |
| • The effects of pollution on public health are worse than we realise | • All people<br>• People in the community |
| *Biospheric items* | *Biospheric items* |
| • Over the next several decades, thousands of species will become extinct | I am concerned about environmental problems because of the consequence for _____ |
| • Claims that current levels of pollution are changing earth's climate are exaggerated | • Birds<br>• Plants |

*Table 2. Published reliability statistics for AC subscales*

| | Awareness of Consequences Scales | | |
|---|---|---|---|
| | ACego | ACsoc | ACbio |
| Cronbach's Alpha | | | |
| Hansla et al. (2008) | .64 (2 items) | .56 (2 items) | .56 (3 items) |
| Snelgar (2006) | .30 (4 items) | .56 (5 items) | .46 (4 items) |
| Gärling et al. (2003) | .45 (2 items) | .42 (2 items) | .54 (2 items) |
| Joireman et al. (2001) | .67 (4 items) | .76 (5 items) | .65 (4 items) |
| Theta Reliability | | | |
| Stern et al. (1993) | .66 (3 items) | .62 (3 items) | .56 (3 items) |
| Stern, Dietz, Kalof et al. (1995) | .77 (2 items) | .71 (2 items) | .73 (4 items) |

*Table 3. AC scale items in recent studies*

| | Administered | | |
|---|---|---|---|
| | Spash 1 | Spash 2 | Snelgar (2006) |
| ACego1: Environmental protection will provide a better world for me and my children | √ | √ | × |
| ACego2: Environmental protection is beneficial to my health | √ | √ | √ |
| ACego3: Protecting the environment will threaten jobs for people like me | √ | √ | √ |
| ACego4: Laws to protect the environment limit my choice and personal freedoms | √ | √ | √ |
| ACego5: A clean environment provides me with better opportunities for recreation | √ | √ | √ |
| ACsoc1: Environmental protection benefits everyone | √ | √ | √ |
| ACsoc2: Environmental protection will help people have a better quality of life | √ | √ | √ |
| ACsoc3: We don't need to worry much about the environment because future generations will be better able to deal with these problems than we are | √ | √ | √ |
| ACsoc4: The effects of pollution on public health are worse than we realise | √ | √ | √ |
| ACsoc5: Pollution generated here harms people all over the earth | √ | √ | √ |
| ACbio1: While some local plants and animals may have been harmed by environmental degradation, over the whole earth there has been little effect | √ | × | √ |
| ACbio2: Over the next several decades, thousands of species will become extinct | √ | √ | √ |
| ACbio3: Claims that current levels of pollution are changing earth's climate are exaggerated | √ | √ | √ |
| ACbio4: Tropical rain forests are essential to maintaining a healthy planet earth | √ | √ | × |
| ACbio5: Modern development threatens wildlife | × | × | √ |

*Table 4. Study 1 and 2 Pearson bivariate correlations between AC subscales*

| | Egoistic & Social | Egoistic & Biospheric | Social & Biospheric |
|---|---|---|---|
| Spash Study 1 | 0.669** | 0.570** | 0.596** |
| Spash Study 2: Non-random Sample | 0.672** | 0.569** | 0.642** |
| Spash Study 2: Random Sample | 0.662** | 0.459** | 0.634** |

** $p < 0.001$

*Table 5. Study 1 and 2 Cronbach's α for AC subscales*

| | Egoistic Scale | Social Scale | Biospheric Scale |
|---|---|---|---|
| Spash Study 1 | .559 | .688 | .530 |
| Spash Study 2: Non-random | .603 | .715 | .521 |
| Spash Study 2: Random | .602 | .701 | .440 |

*Table 6. Rotated components matrix for Spash and Snelgar studies*

| | Factors | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spash Studies | | | | | | | | Snelgar | | |
| | Study 1 | | | Study 2 Non-Random | | | Study 2 Random | | Study 2006 | | |
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 1 | 2 | 3 |
| ACego1 | **.810** | | | **.834** | | | **.763** | | | | |
| ACego2 | **.694** | | | **.825** | | | **.688** | | **.762** | | |
| ACego5 | **.678** | | | **.666** | .379 | | **.761** | | **.331** | | |
| ACsoc1 | **.590** | | | **.755** | | | **.731** | | **.554** | | .384 |
| ACsoc2 | **.807** | | | **.765** | | | **.769** | | **.609** | .410 | |
| ACbio4 | **.586** | -.315 | | **.729** | | | **.656** | | | | |
| ACego3 | | **.664** | | | | **.719** | | **.691** | | | **.740** |
| ACego4 | | **.700** | | | | **.723** | | **.739** | | | **.745** |
| ACsoc3 | | **.639** | | | | **.609** | -.306 | **.552** | | **.742** | |
| ACbio1 | | **.620** | -.336 | | | | | | | **.722** | |
| ACbio3 | -.306 | **.503** | | | **-.492** | **.483** | | **.397** | | **.720** | |
| ACsoc4 | .509 | | **.476** | | **.730** | | **.632** | | | .484 | |
| ACsoc5 | .330 | | **.759** | .375 | **.715** | | **.688** | | **.650** | | |
| ACbio2 | | | **.777** | | **.738** | | **.621** | | **.594** | | |
| ACbio5 | | | | | | | | | **.479** | | |

*Table 7. The items for the four consistent clusters*

**Factor 1 – Benefits of Action**

ACego1: Environmental protection will provide a better world for me and my children

ACego2: Environmental protection is beneficial to my health

ACego5: A clean environment provides me with better opportunities for recreation

ACsoc1: Environmental protection benefits everyone

ACsoc2: Environmental protection will help people have a better quality of life

ACbio4: Tropical rain forests are essential to maintain a healthy planet earth

**Factor 2 – Costs of Action**

ACego3: Protecting the environment will threaten jobs for people like me

ACego4: Laws to protect the environment limit my choice and personal freedoms

**Factor 3 – Benefits of Inaction**

ACsoc3: We don't need to worry much about the environment because future generations will be better able to deal with these problems than we are

ACbio1: While some local plants and animals may have been harmed by environmental degradation, over the whole earth there has been little effect

ACbio3: Claims that current levels of pollution are changing earth's climate are exaggerated

**Factor 4 – Costs of Inaction**

ACsoc4: The effects of pollution on public health are worse than we realise

ACsoc5: Pollution generated here harms people all over the earth

ACbio2: Over the next several decades, thousands of species will become extinct

ACbio5: Modern development threatens wildlife

*Table 8. Bivariate correlations for the newly proposed subscales*

| | Spash Studies | | |
|---|---|---|---|
| | Study 1 | Study 2: Non-random | Study 2: Random |
| Benefit of Action & Cost of Inaction | .550** | .579** | .610** |
| Benefit of Action & Benefit of Inaction | -.414** | -.370** | -.385** |
| Benefit of Action & Cost of Action | -.172** | -.174** | -.144** |
| Cost of Inaction & Benefit of Inaction | -.330** | -.342** | -.294** |
| Cost of Inaction & Cost of Action | -.138* | -.059 | .021 |
| Benefit of Inaction & Cost of Action | .466** | .360** | .286** |
| Consequences of Action & Inaction | -.381** | -.330** | -.303** |

** $p < .001$ * $p < .005$

*Table 9. Cronbach's α for newly proposed subscales*

| | Spash Studies | | |
|---|---|---|---|
| | Study 1 | Study 2: Non-random | Study 2: Random |
| Benefits of Action | .824 (6 items) | .891 (6 items) | .876 (6 items) |
| Costs of Inaction | .671 (3 items) | .739 (3 items) | .676 (3 items) |
| **Consequences of Environmental Action** | .841 (9 items) | .886 (9 items) | .877 (9 items) |
| Benefits of Inaction | .539 (3 items) | .404 (2 items) | .347 (2 items) |
| Costs of Action | .437 (2 items) | .452 (2 items) | .441 (2 items) |
| **Consequences of Environmental Inaction** | .654 (5 items) | .563 (4 items) | .501 (4 items) |